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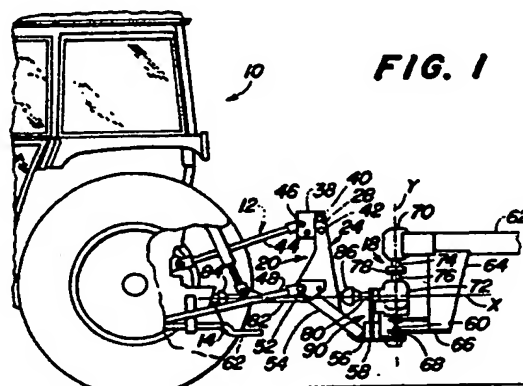
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54 Tractor and Implement drawn thereby.

57 A hitch adapter (20) is used to couple a PTO-driven implement to a three-point hitch (12) arrangement of a towing tractor (10). The implement includes a transmission assembly (18) mounted for rotation about an upright axis (Y) that passes through a ball connection (68) effected between a drawbar (58) of the hitch adapter (20) and the implement tongue (16). The tractor power take-off shaft (14) is connected by a telescopic drive shaft (82) to an input shaft (80) of the transmission assembly (18) for rotation about an axis (X) extending perpendicular to and intersecting the upright axis (Y). Provided for steering the transmission assembly (18) for maintaining the input shaft (80) disposed in parallel relationship to the tractor power take-off shaft (14) is a steering assembly including a pair of steering arms (94, 96) depending from the transmission assembly (18) and engaging diametrically opposite locations of a cylindrical guide surface of a guide member (92) fixed to the drawbar (58) with the guide surface arranged concentrically to an axis located in a plane containing the previously mentioned axes (Y, X) and

intersecting the upright axis (Y) at the ball connection (68).



Tractor and Implement drawn thereby

The present invention relates to a tractor and implement drawn thereby having a draft tongue on the implement connected to the tractor, and a transmission assembly which is supported on the tongue for rotation about an upright first axis and which has an input shaft on a second axis at right angles to, and intersecting, the first axis.

Such a tractor and implement is described in US-A-4,525,987.

In our co-pending EP-A-0 269 901 which was published after the priority date of the present application we describe an agricultural implement including a hitch adapter having a drawbar coupled to the implement draft tongue by a hitch ball connector. An implement drive transmission includes a gearbox or housing mounted on the draft tongue for pivoting about an upright axis passing through the ball connector. An input shaft is mounted in the housing for rotation about an axis extending perpendicular to the upright axis and is adapted for connection to a tractor PTO shaft. A steering arm is vertically pivotally attached to the transmission housing and carries a ball slidably located in a force-and-aft extending guide channel fixed to the adapter and having sidewalls shaped complementarily to the ball. While the steering arm and guide channel cooperate so as to maintain the input shaft in a disposition which would be parallel to the tractor PTO shaft during turning of the hitch adapter about the upright axis, it has been found that the steering arm and guide channel will effect an unwanted "steering" of the input shaft when the hitch adapter rolls about an axis extending crosswise to the upright axis.

The present invention enables this difficulty to be avoided. It enables the tractor to turn sharply without undue resultant wear in driven components of the implement or the drive for such components.

According to the present invention the tractor has a three-point hitch, a hitch adapter is connected between the tongue and the three-point hitch, the first axis passing through the hitch adapter's connection to the tongue, the hitch adapter has a guide member with an abutment surface concentric with a third axis in a plane containing the first and second axes and passing through the said connection, and the transmission assembly has a steering arm engaging diametrically opposite locations on the abutment surface so that rolling motion of the hitch adapter about the third axis relative to the tongue will not effect any steering motion of the transmission assembly about the first axis.

Thus the above-mentioned difficulty is avoided, and said wear is reduced.

An embodiment of the invention will now be described with reference to the accompanying diagrammatic drawings in which:

Fig. 1 is a left side elevational view showing a tractor three-point hitch and PTO shaft coupled to an implement having a hitch adapter and transmission housing and associated steering structure;

Fig. 2 is a left rear perspective view of the structure shown in Fig. 1; and

Fig. 3 is a rear view showing the relative position that the implement transmission and hitch adapter occupy with the tractor rolled to the left relative to the implement.

Referring now to the drawings, there is shown a rear portion of a tractor 10 provided with a three-point hitch 12 and a power take-off shaft 14 to which an agricultural implement having a tongue 16 and transmission or drive assembly 18 is semi-integrally coupled for being towed and driven by the tractor.

Specifically, the tongue 16 is coupled directly to the three-point hitch 12 by a hitch adapter 20 including an upright mast structure defined by right and left legs 22 and 24, respectively, including respective upright, parallel spaced upper end portions 26 and 28 from which respective central portions 30 and 32 diverge downwardly to upright, parallel spaced lower end portions 34 and 36. A U-shaped channel member 38 is received between the upper end portions 26 and 28 and secured thereto by upper and lower fasteners 40 and 42, respectively. An upper link 44 of the three-point hitch 12 is coupled to the member 38 by a coupling pin 46 while lower links 47 and 48 of the hitch are coupled to the lower end portions 34 and 36 by respective coupling pins 50 and 52. A bowed cross member 54 has its opposite end portions respectively joined to the bottoms of the legs 22 and 24 and includes a central portion 56 which, as viewed in Fig. 1, is spaced downwardly and rearwardly from the leg bottoms. A fore-and-aft extending drawbar 58 is secured, as by weldment, to the cross member central portion 56 and carries an upright stud 60 at its distal end. As shown in Fig. 1, the drawbar 58 is in a normal working position wherein it is generally horizontally disposed at an elevation commensurate with that of tractor drawbar 62.

The implement tongue 16 includes a fore-and-aft-extending box beam 62 having a depending structural member 64 secured thereto adjacent the forward end thereof. Fixed to the bottom of the member 64 and projecting forwardly therefrom is a horizontal hitch plate 66 carrying a ball connector

68 that is received on the drawbar stud 60.

The transmission assembly 18 includes an upper right-angle gear housing or box 70 fixed to the forward end of the box beam 62 and which supports a lower right angle gear housing or box 72 by means of an input shaft 74 journaled in the housing 70, an output shaft 76 journaled in the housing 72 and a sprocket and chain coupler assembly 78 joining the shafts 74 and 76. The shafts 74 and 76 lie along an upright axis Y that passes through the ball connector 68 and the lower gear housing 72 may swivel about the axis Y. An input shaft 80 is journaled in the housing 72 for rotation about an axis X extending perpendicular to and intersecting the axis Y. Power from the PTO shaft 14 is delivered to the input shaft 80 by a telescopic drive shaft 82 having its forward and rearward ends respectively coupled to the shafts 14 and 80 by universal joints 84 and 86.

Provided for steering the lower gear housing 72 so that it maintains a parallel relationship to the PTO shaft 14 to ensure that the universal joints are not operated at angles which could result in the drive of the implement being accelerated at unacceptable levels is a steering assembly 90. The assembly 90 includes a guide member 92 in the form of a partial cylindrical tube welded or otherwise fixed to the top of the drawbar 58 with the cylindrical surface being disposed upwardly from the drawbar and concentrically to an axis located in a plane containing the axes X and Y and extending through the ball connector 68. The steering assembly 90 further includes steering arm or follower means comprising right and left steering members 94 and 96 formed from angle members fixed to opposite sides of the lower gear housing 72 and having lower end portions straddling the guide member 92 and having respective flat surfaces 98 and 100 engaged with diametrically opposite portions of the guide member. Since the tractor 10 and, hence, the hitch adapter 20 roll about the ball connector 68 relative to the implement tongue 16, it will be appreciated that the steering members will remain in contact (see Fig. 3) with the guide 92 throughout such rolling so that guide member 92 will cooperate with the steering members 94 and 96 to effect steering of the gear housing 72 in the event that the tractor turns about the axis Y while rolling about the ball connector 68 but will have no effect on the housing 72 in the event no turning of the tractor is taking place during such rolling.

Claims

1. A tractor and implement drawn thereby having a draft tongue (16) on the implement connected to the tractor (10), and a transmission assembly

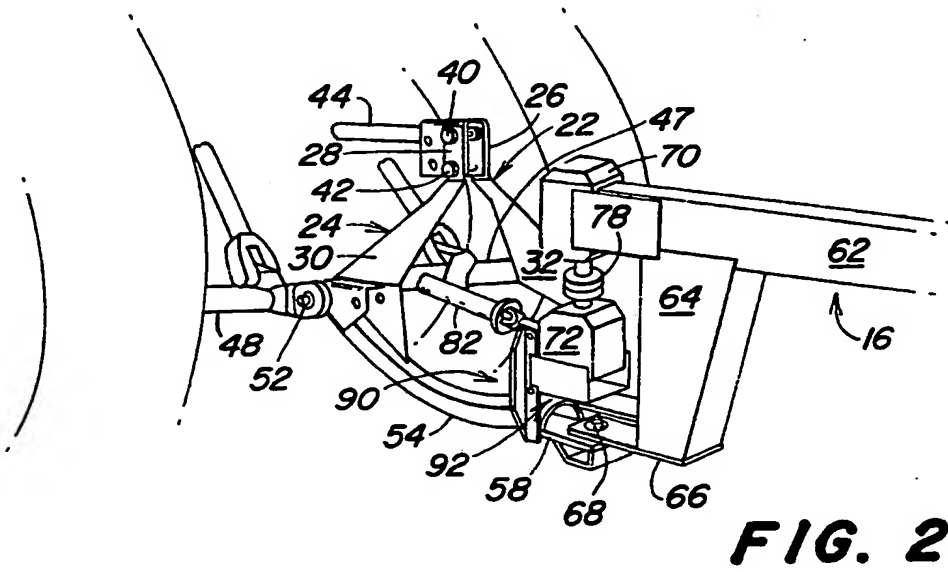
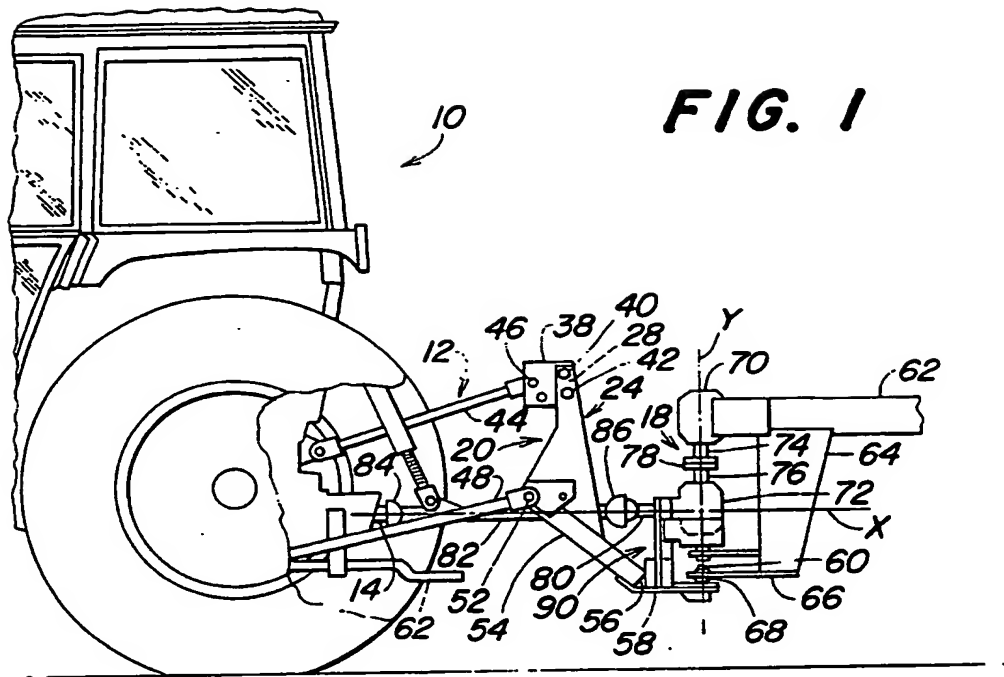
(18) which is supported on the tongue (16) for rotation about an upright first axis (Y) and which has an input shaft (80) on a second axis (X) at right angles to, and intersecting, the first axis (Y) characterised in that the tractor (10) has a three-point hitch (12), a hitch adapter (20) is connected between the tongue (16) and the three-point hitch (12), the first axis (Y) passing through the hitch adapter's connection (68) to the tongue (16), the hitch adapter (20) has a guide member (92) with an abutment surface concentric with a third axis in a plane containing the first and second axes (Y, X) passing through the said connection (68), and the transmission assembly (72) has a steering arm (94, 96) engaging diametrically opposite locations on the abutment surface so that rolling motion of the hitch adapter (20) about the third axis relative to the tongue (16) will not effect any steering motion of the transmission assembly (18) about the first axis (Y).

2. A tractor and implement according to claim 1 characterised in that the guide member (92) is tubular.

3. A tractor and implement according to claim 1 or 2 characterised in that the steering arm comprises a pair of parallel upright beams (94, 96).

4. A tractor and implement according to claim 3 characterised in that the beams are angle beams (94, 96) fixed to opposite sides of the transmission assembly (18).

5. A tractor and implement according to any preceding claim characterised in that the hitch adapter (20) has a rearwardly projecting central portion (58) extending beneath the transmission assembly (18) for the connection (68) to the tongue (16), the guide member (92) being attached to the central portion (58).



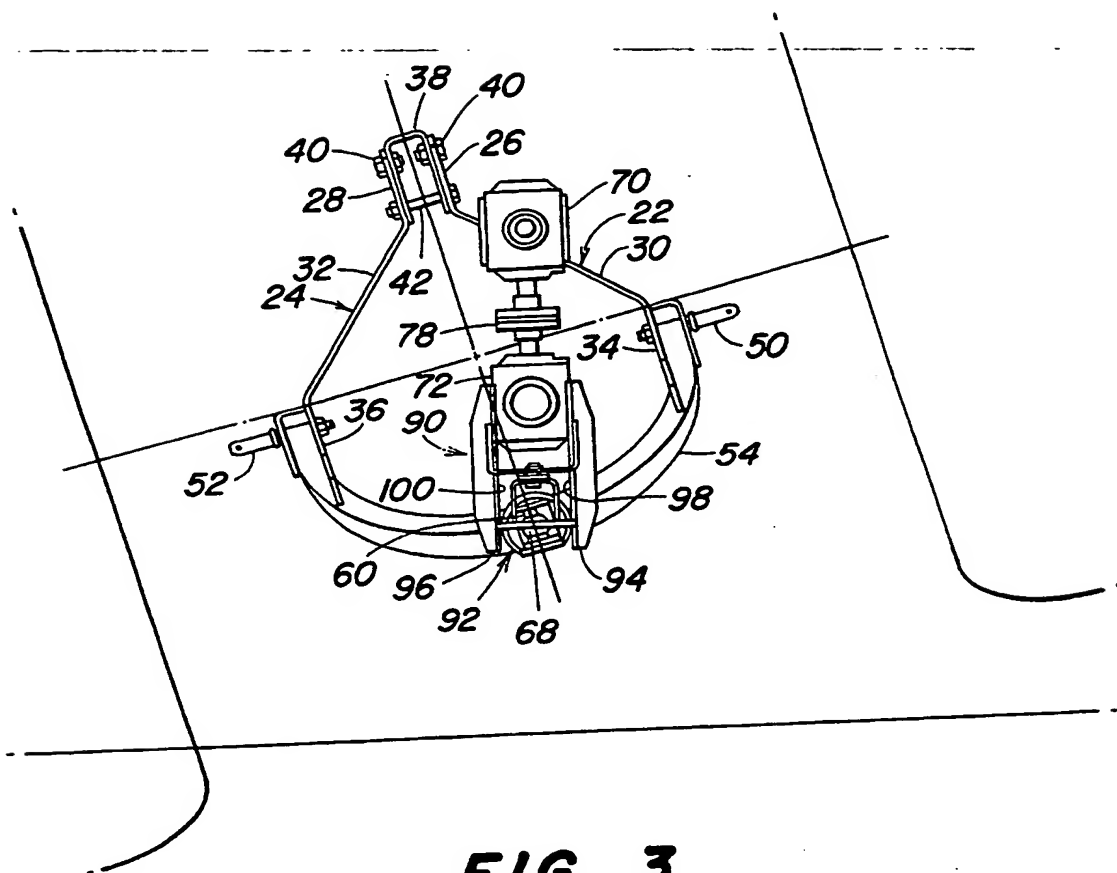


FIG. 3